

## BETTER METHODS FOR EQUIPPING, SUSTAINING, AND TRAINING OUR MEDICAL FORCE

BY

COLONEL THOMAS C. SLADE  
United States Army

### DISTRIBUTION STATEMENT A:

Approved for Public Release.  
Distribution is Unlimited.

USAWC CLASS OF 2010

This SRP is submitted in partial fulfillment of the requirements of the Master of Strategic Studies Degree. The views expressed in this student academic research paper are those of the author and do not reflect the official policy or position of the Department of the Army, Department of Defense, or the U.S. Government.



U.S. Army War College, Carlisle Barracks, PA 17013-5050

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE <b>30 MAR 2010</b>		2. REPORT TYPE		3. DATES COVERED	
4. TITLE AND SUBTITLE <b>Better Methods for Equipping, Sustaining, and Training our Medical Force</b>				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) <b>Thomas Slade</b>				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>U.S. Army War College ,122 Forbes Ave.,Carlisle,PA,17013-5220</b>				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release; distribution unlimited.</b>					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT <b>see attached</b>					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES <b>32</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			

The U.S. Army War College is accredited by the Commission on Higher Education of the Middle State Association of Colleges and Schools, 3624 Market Street, Philadelphia, PA 19104, (215) 662-5606. The Commission on Higher Education is an institutional accrediting agency recognized by the U.S. Secretary of Education and the Council for Higher Education Accreditation.

# **PROPERTY OF U.S. ARMY**

USAWC STRATEGY RESEARCH PROJECT

## **BETTER METHODS FOR EQUIPPING, SUSTAINING, AND TRAINING OUR MEDICAL FORCE**

by

Colonel Thomas C. Slade  
United States Army

Colonel Steven T. Rumbaugh  
Project Adviser

This SRP is submitted in partial fulfillment of the requirements of the Master of Strategic Studies Degree. The U.S. Army War College is accredited by the Commission on Higher Education of the Middle States Association of Colleges and Schools, 3624 Market Street, Philadelphia, PA 19104, (215) 662-5606. The Commission on Higher Education is an institutional accrediting agency recognized by the U.S. Secretary of Education and the Council for Higher Education Accreditation.

The views expressed in this student academic research paper are those of the author and do not reflect the official policy or position of the Department of the Army, Department of Defense, or the U.S. Government.

U.S. Army War College  
CARLISLE BARRACKS, PENNSYLVANIA 17013

## **ABSTRACT**

AUTHOR: Colonel Thomas C. Slade

TITLE: Better Methods for Equipping, Sustaining, and Training our Medical Force

FORMAT: Strategy Research Project

DATE: 26 February 2010 WORD COUNT: 6,535 PAGES: 32

KEY TERMS: Logistics, Requirements, Supplies

CLASSIFICATION: Unclassified

Current policies for equipping Army field medical units are ineffective and inefficient, leading to units that are ill-prepared for their deployment missions. With reduced resources it is critical that military medical acquisition programs provide the most current technology in a timely and cost effective manner. This paper will review how the Army Medical Department has historically procured and fielded medical units and will analyze how these procedures have led to suboptimum results in equipping, sustaining and training medical personnel. This paper will propose recommended solutions to procurement and fielding policies and procedures which will ensure our medical units have the most current technology available, thus providing the best care available to the warfighter on the battlefield.

## BETTER METHODS FOR EQUIPPING, SUSTAINING, AND TRAINING OUR MEDICAL FORCE

“The emerging reduction in available resources and the simultaneous increase in legitimate requirements compound the Army’s challenge to equip the force.”<sup>1</sup> With reduced resources it is critical that military medical acquisition programs provide the most current technology in a timely and cost effective manner. Current policies for equipping Army field medical units are both ineffective and inefficient. This has resulted in units being fielded either obsolete equipment and supplies which do not meet clinical requirements or being fielded new equipment in an austere deployed environment for which it hasn’t been properly tested and in which it will be expected to operate. This has led to units which are ill-equipped and ill-trained, and thus unprepared for their deployment missions. Previous General Accounting Office reports have specifically recommended the Army “develop policies and procedures for equipping and supplying hospitals deployed to a theater of operations to ensure full mission capability upon arrival.”<sup>2</sup> We must also be able to react more quickly to changing requirements, basing requirements on missions and not tie ourselves to Modified Tables of Organization and Equipment (MTOEs) authorization documents. Most of the recent Request for Forces being received from the Combatant Commanders have been for special requirements requiring unique equipment capabilities.<sup>3</sup>

History has shown that while field military medical care has always reacted quickly and provided adequate care, we have been fortunate that casualty counts since Desert Shield/Desert Storm have been relatively low. If the First Gulf War had

commenced more quickly, lasted longer, or casualty figures had more closely matched predictions, most analysts believe medical care would have been grossly inadequate.<sup>4</sup>

This paper will review how the Army Medical Department (AMEDD) has historically procured for and fielded medical units and will analyze how these procedures have led to suboptimum results in equipping, sustaining and training medical personnel. This essay will review our two most recent major deployments, Operation Desert Shield/Desert Storm and Operation Iraqi Freedom and discuss the problems and challenges that were created due to poor planning, inability to properly identify requirements and ineffective policies and procedures. This paper will demonstrate progress that has already been made and recommend solutions to improve planning, procurement and fielding policies, as well as outlining a requirements determination process which will ensure our field medical units have the most current technology and supplies available, thus providing the best care available to the warfighter on the battlefield.

#### Operation Desert Shield/Desert Storm

Expecting high casualty rates, the AMEDD deployed 198 medical units to support combat forces during Operation Desert Shield/Desert Storm. These forces consisted of 23,000 AMEDD Soldiers, 55% of which were medical personnel out of the Reserve Component.<sup>5</sup> This represented the largest build up of medical forces since World War II and the most rapid deployment of AMEDD forces that had ever been undertaken.<sup>6</sup> As a result, medical units, particularly hospital and logistics units, faced many unique equipping and training issues upon activation for deployment.

The AMEDD was in the midst of a modernization program when units were alerted for deployment for Operation Desert Shield in August of 1990. This was the first

modernization program in twenty years for the AMEDD and involved transitioning from the Mobile Unit Self Contained (MUST) hospitals to the newly developed Deployable Medical Systems (DEPMEDS) configured hospitals. Four early deploying hospitals deployed with their MUST hospitals and a Field Hospital was deployed with General Purpose tentage and it was quickly determined these hospitals would not be able to handle the rigors of the extreme environmental conditions of the Middle East.

Temperatures inside these hospitals consistently exceeded 100 degrees and tentage was often torn by sand and wind storms.<sup>7</sup> These unanticipated equipment issues created a situation where current standards of care were not being met and changes needed to be implemented rapidly to correct these deficiencies. As a result it was determined on 1 November 1990 that these hospitals, along with any future deploying hospitals, would be converted to the DEPMEDS Hospital configuration.<sup>8</sup> This ultimately led to the deployment of 35 DEPMEDS configured hospitals into the theater of operation, with 28 of these hospitals being converted in Saudi Arabia.<sup>9</sup>

This expedited conversion to DEPMEDS hospitals led to many equipping and training challenges. Because this was a new procurement and fielding program there were still many significant shortages with the medical materiel sets (MMS). The majority of these DEPMEDS sets were issued from Prepositioning of Materiel Configured to Unit Sets (POMCUS) and Primary Mobilization (PRIMOB) stocks.<sup>10</sup> “The average set contained only 60 percent of the required equipment, while fill rates of individual sets ranged from 28 to 82 percent.”<sup>11</sup> The procurement, packaging, consolidation and fielding of these shortages to the right unit proved very challenging. The complexity of this process led to the deployment of a fielding team with representatives from the United



States Army Medical Materiel Agency (USAMMA), Office of the Surgeon General (OTSG), and the DEPMEDS Program Management Office.<sup>12</sup> This strategy was effective and dramatically improved the ability to get shortages “married-up” to units, unfortunately, some units still reported that they either received their shortages too late in the operation or they never received them at all.<sup>13</sup>

Late deployment of DEPMEDS also had a significant impact on training as the equipment was not accessible to units to facilitate training opportunities. DEPMEDS included not only new medical equipment, but it also included Tent Extendable Modular Personnel (TEMPER) tents and International Standards Organization (ISO) shelters. A condensed training program for DEPMEDS was provided to units. This training was conducted either at home station prior to deployment or when the unit arrived in theater. The program consisted of a condensed one week course and mainly concentrated on how to set up TEMPER tents. In addition, many units were required to turn in their MUST equipment at the same time as the new equipment training which detracted from the training being provided.<sup>14</sup> The normal DEPMEDS training program is a three week program and addresses in detail how to establish the hospital complex and also provides new equipment training (NET) on all the new medical equipment. The 115<sup>th</sup> Mobile Army Surgical Hospital's training readiness was so poor they were eventually disbanded and their personnel were sent to supplement other hospital facilities within the theater. According to the Central Command (CENTCOM) Surgeon this lack of training on equipment in DEPMEDS resulted in nurses and physicians preferring to use equipment they were more familiar with.<sup>15</sup>

The decision to support physician preference vice standardization resulted in even more challenges to an already taxed medical logistics system. More than 50% of the medical items stocked in theater were for items not identified as part of the DEPMEDS database.<sup>16</sup> This highlights the significant disparity between actual requirements - what the physicians identified as requirements, and perceived requirements - those requirements that are included in the DEPMEDS database. This also impacted the sustainment stock match in war reserve. Sustainment stocks are configured to match what is authorized in the medical materiel sets and medical equipment sets and are not based on what the individual physician prefers.

Many doctors and nurses had not been trained to perform, nor did they understand their wartime mission. These clinical professionals worked daily providing peacetime care in a fixed medical facility, but most had never conducted field training with their field hospital units. In a peacetime environment a physician's mission is to provide the full range of treatment until a patient is ready to be discharged from the hospital. In combat, forward deployed hospitals have a vastly different mission. In a forward deployed environment the role of the physician is to provide enough care to stabilize the patient so that the patient can be further evacuated to the rear where the patient can then receive more definitive care. The CENTCOM Surgeon stated that this had a big impact on the Mobile Army Surgical Hospitals (MASH) and the Combat Surgical Hospitals (CSH) where "if it were left to the physicians, all beds would have remained occupied, diminishing the units' ability to treat incoming patients."<sup>17</sup> This also puts a strain on the logistics system as the consumption rate and variety of supplies required for patient care is increased. The CENTCOM Surgeon further stated that "the

overwhelming emphasis on peacetime health care conflicted with the training and readiness of Army clinical personnel to provide the best medical care to large numbers of casualties in the combat zone.”<sup>18</sup>

Supply discipline was also lacking as units did not have confidence in the supply system, which led to units hoarding supplies. At times this overwhelmed the in-theater medical supply system.<sup>19</sup> Early arriving units were the worst violators and one unit was found to have 120 days of supply.<sup>20</sup> Medical supply systems did not provide asset visibility at the unit level so there was no way to capture what each unit had on-hand, as a result, cross leveling of supplies was not possible. Requisitions were also processed on a “first-in, first-out” basis which is why early arriving units were robust while units deploying late were lean and unable to obtain needed shortages.<sup>21</sup> As the supply officer for the 2<sup>nd</sup> MASH, I can attest to this situation. Our unit deployed in late December and we had a very difficult time filling critical shortages. We were finally able to fill most of our shortages by coordinating directly with some of the early deploying and more established hospitals. While direct unit coordination resolved the immediate issue, it did not resolve the underlying inefficient process issues within the medical logistics systems that needed correction.

### Operation Iraqi Freedom

The medical logistics system was fraught with many of the same issues that were seen ten years earlier during Operation Desert Storm. Major issues included late deployment of medical logistics units, supplies, equipment and infrastructure; poor requirements identification; lack of standardization; and inadequately trained personnel. Clinicians were very concerned as just days prior to hostilities many basic and critical supplies required for proper medical care had still not arrived. Vital items such as

morphine for pain relief, antibiotics for wound treatment, laboratory reagents, and materials for the making of casts were all lacking. Oxygen supplies would also have been quickly depleted if large numbers of casualties had been experienced.<sup>22</sup>

DEPMEDS medical sets are configured to treat Soldiers in combat. The sets are not configured to support basic sick call, nor are they arranged to treat enemy prisoners of war (EPWs) or civilian casualties, specifically pediatric patients. Invariably, deployed CSH's missions expand to treat these additional categories of casualties, yet we continue to deny this reality by not configuring our medical treatment sets accordingly. The 47<sup>th</sup> CSH treated numerous pediatric trauma patients which forced the unit to scramble to obtain the necessary supplies to treat these patients. This is a reality that should have been appropriately planned for and the unit should have been fielded with the appropriate equipment and supplies to treat these non-U.S. Soldier casualties.<sup>23</sup>

Standardization of medical equipment and supplies is a virtual necessity for any military medical unit, especially early in an austere deployed environment. The replenishment of non-standard supplies and repair parts in war is a very complicated process and strains our medical logistics system.<sup>24</sup> Non-standard equipment also challenges the maintenance system, not only with the procurement of repair parts but also with the difficulty of having properly trained technicians to repair technologically complex medical equipment. If the equipment is not supportable in a theater of operations it can quickly become a "paper-weight" and a source of tension between the physician, who can't understand why the medical logistician cannot support his requirement in an expeditious manner, and the logistician who can't understand why a physician can't just use the equipment that is authorized on the MTOE.

Lack of standardization during Operation Iraqi Freedom (OIF) resulted in inefficiencies within the medical logistics system. Many of the same issues that occurred during Operation Desert Shield/Desert Storm reappeared during OIF. Sustainment requirements were identified using the Medical Contingency File (MCF) program which “consolidates and aggregates the time-phased wartime requirements from all Services.”<sup>25</sup> The MCF is a tool used by the services and Defense Logistics Agency (DLA) to identify medical contingency requirements. The requirements identified in the MCF, however, did not accurately predict items being ordered by medical units. In fact, only 32% of the items ordered by units matched what was included in the MCF.<sup>26</sup>

The United States Army Medical Materiel Center – Southwest Asia (USAMMC-SWA) was the medical supply support activity (SSA) for the Middle East. USAMMC-SWA's initial stocks for their operation included 2800 line items of Army War Reserve prepositioned materiel. Analysis determined that only about 20% of this materiel was actually ordered and used by customers, this was worse than the 50% figure seen during Desert Storm. In fact almost 800 lines of this materiel was never ordered. This led to millions of dollars of prepositioned war reserve sustainment stocks being wasted due to poor identification of requirements.<sup>27</sup>

Clinical preference continues to drive requirements within a theater of operation. The 226<sup>th</sup> Medical Logistics Battalion found stocking the appropriate medical items was very difficult due to clinical preference and rotations of clinical personnel. Ordering non-standard items significantly increases the customer wait time, strains the medical supply system, and increases the man hours required to research and catalog these items.<sup>28</sup>

Medical logisticians lack the necessary skills to run a medical supply support activity (SSA) in a field environment. Units are challenged because medical logistics units, with the exception of the 563<sup>rd</sup> Medical Logistics Company in Korea, do not have a garrison supply mission. This lack of sustainment training significantly impacts the medical logistics community's ability to rapidly establish a functional medical logistics SSA. The 226<sup>th</sup> Medical Logistics Battalion compensated for this lack of sustainment training by deploying one of their medical logistics companies to the U.S. Army Medical Materiel Center – Europe (USAMMCE). USAMMCE is the theater lead agent for medical materiel (TLAMM) for EUCOM and provides medical logistics support to military operations at EUCOM, Central Command (CENTCOM), African Command (AFRICOM) and Department of State on a daily basis. This decision by the 226<sup>th</sup> Medical Logistics Battalion ensured their Soldiers were well trained and had the skill set required to organize and operate the medical SSA in Iraq during OIF2.<sup>29</sup>

Training on medical logistics system hardware and software was noted as a significant training shortfall in many medical units. The G-4, U.S. Army Europe (USAREUR) noted in OIF1 that units were uncomfortable using medical logistics automation systems. Proficiency on the Theater Army Medical Management Information System (TAMMIS), TAMMIS Customer Assistance Module (TCAM) and Combat Automated System Support – Medical (CASS-M) was found to be a significant shortfall. USAREUR was proactive and brought in trainers from the AMEDD Center and School prior to OIF2 and provided training on these systems to all deploying units.<sup>30</sup>

The 591<sup>st</sup> Medical Logistics Company, the first medical logistics unit to deploy to Iraq, noted significant training shortfalls, with only one medical supply specialist (91J)

out of twelve being proficient in the use of the CASS-M computer hardware. Fortunately, the Information Management Office (IMO) shop for the 591<sup>st</sup> attended a CASS-M refresher course as part of their pre-deployment training. As a result the IMO shop was very proficient and was able to provide training internally to company personnel. The IMO shop was later tasked to provide training and assist other units within theater to overcome their CASS-M issues. On several occasions the lack of standardization on CASS-M systems prohibited the IMO shop from assisting all units as they were not familiar with certain system configurations which had been fielded. The 591<sup>st</sup> Company Commander also noted that most of his 91J's were not proficient in the basics of operating the TAMMIS software. His Soldiers specifically did not know how to operate the system to perform daily back-ups, build stock record files and process receipts, which are all basic tasks required of a 91J. This ultimately led to inefficiencies and problems within the supply chain.<sup>31</sup>

Late fielding of equipment and supplies continued to plague the medical community. The 21<sup>st</sup> CSH received their "ship-short" package of non-expendable equipment, potency and dated items, and narcotics from USAMMA several days after they had rail loaded their equipment and moved it to the Sea Port of Embarkation (SPOE). This late arrival of supplies did not allow the unit adequate time to inventory supplies as they immediately had to coordinate to get commercial transportation to move these supplies and equipment to Jacksonville, Florida in order to meet up with the rest of their equipment. They were only able to inventory the non-expendable equipment and narcotics and relied on the initial assurances from USAMMA that their potency and dated package was 90-95% complete. It was not until weeks later that USAMMA

notified the 21<sup>st</sup> CSH that their potency and dated package was only 50% complete and failed to provide the unit with an accurate shortage listing. This resulted in the unit ordering thousands of dollars in supplies because they were unsure whether or not they had received them in their potency and dated package. This placed an additional burden on an already strained medical supply chain.<sup>32</sup>

Three primary issues which arose in the area of medical equipment maintenance included difficulty in obtaining repair parts, units deploying numerous pieces of equipment into theater which were not fully mission capable (FMC), and environmental conditions which made it difficult to keep technologically sensitive equipment operational. These were all lessons relearned from Operation Desert Shield/Desert Storm. Initially the 591<sup>st</sup> Medical Logistics Company was the sole theater provider for medical maintenance in Iraq. This unit deployed into theater with communication equipment shortages which resulted in an inability to communicate with their supporting battalion equivalent rear element, the U.S. Army Medical Materiel Center – Southwest Asia (USAMMC-SWA) which was located in Qatar. This situation has since been remedied with the fielding of Combat Service Support – Very Small Aperture Terminal (CSS-VSAT) system. The unit also deployed without an established authorized stockage list (ASL) for high use repair parts, forcing the medical maintainers to rely on either rear support or a repair part supply system, both of which were difficult to contact due to communication issues, and both of which were in their infancy as operations were being established. Availability of local distributors for medical equipment repair parts had neither been identified nor had contracts been established to use any local sources. With most medical equipment being low density, patient care can quickly



become compromised when even one piece of equipment such as a Computed Tomography (CT) scanner or an X-Ray machine isn't fully mission capable.<sup>33</sup>

Army MTOE hospitals are not fully staffed during peacetime which makes proper care and maintenance of the equipment very difficult. The majority of the clinical staff are assigned to a Table of Distribution and Allowance (TDA) fixed hospital providing daily medical care to Soldiers, retirees and family members. These clinical personnel fall under the Professional Officer Filler System (PROFIS). The PROFIS system assigns these clinical professionals, mainly doctors and nurses, to MTOE medical units upon receipt of deployment orders. This program conserves very valuable resources, but it leads to integration, training and, as identified here, maintenance issues within MTOE medical facilities. When the 10<sup>th</sup> Combat Support Hospital opened their Military Van (MILVAN) containers they found equipment that was dirty and had not been properly maintained. Preventive maintenance checks and services (PMCS) had not been performed and some equipment was damaged and not fully mission capable. When medical chests were unpacked for inventory, it was noted that many supplies were also damaged or expired. This has serious consequences on the unit's ability to rapidly provide effective patient care and significantly impacts mission readiness.<sup>34</sup>

DEPMEDS medical equipment undergoes extensive environmental testing to ensure it is able to operate in austere and sometimes extreme environments. In order to expedite fielding of new medical modernization equipment to deploying units, equipment was fielded that did not go through the appropriate environmental testing. Unfortunately, this proved to be a poor decision. Many of these items failed in the extreme temperatures and weather conditions which they encountered. Medical maintenance

sections spent a majority of their time trying to repair these items. These items also did not have integrated logistics support plans developed, so there was no support plan in place for equipment repair. This made obtaining repair parts very difficult as the parts had not been standardized. Proper testing and logistics plans must be in force prior to fielding equipment. Failure to do so results in an increased workload on the medical maintenance section and disappointed customers who become frustrated when they are unable to use this modern equipment.<sup>35</sup>

The 47<sup>th</sup> CSH was one of the deploying hospitals which deployed without its own DEPMEDS hospital, instead they were issued a DEPMEDS hospital out of Army Prepositioned Stocks (APS). The APS set was, for the most part, in very good condition, however there were some issues. The equipment was stored in a non-climate controlled environment in containers AFLOAT on the Merchant Vessel (MV) Titus. The high temperatures inside the containers resulted in plastic parts melting and becoming deformed on ventilators as well as the circuit boards on Propaq monitors shorting out. The APS equipment sets had shortages which required the unit to deploy with some equipment from home station. USAMMA had total asset visibility of the equipment on the MV Titus, so they were able to identify the shortages in advance and coordinate with the 47<sup>th</sup> CSH to fill the shortages. This proved to be a minor inconvenience as it related to the 47<sup>th</sup> CSH property book, but it was not a war stopper.<sup>36</sup>

### The Way Ahead

DLA no longer purchases and stocks large quantities of medical supplies in defense depots, instead they leverage the commercial sector, contracting with medical companies and distributors to provide guaranteed access to medical supplies to meet surge requirements. Since Operation Desert Storm in 1991, DLA's medical supply

inventories have decreased 54% totaling \$299.7 million, a decrease of \$329 million; while sales have shown a \$2.02 billion increase, with total sales in FY09 totaling \$4.53 billion.<sup>37</sup> The Logistics Management Institute (LMI) conducted a study to determine if these contracts provided DLA with the ability to cover medical materiel surge requirements during contingency operations. The study determined that “(1) DLA’s contingency contracts are fundamental; (2) the industrial base is able to support the Department’s medical contingency requirements for medical materiel; and (3) commercial contingency materiel is not used to its fullest potential.”<sup>38</sup>

In addition to service stocks and prime vendor access, DLA uses three primary contingency contracting tools to meet surge requirements. The three methods are (1) Prime Vendor War Readiness Material and Prime Vendor Surge; (2) Vendor Managed Inventory; and (3) Corporate Exigency Contracts. Prime Vendor War Readiness Material and Prime Vendor Surge provides for guaranteed access to required medical supplies held by a distributor. Medical supplies under this contract are geographically located within a region to support identified Service requirements within that region. Release of these supplies requires a direct interaction between the Service point of contact and the Prime Vendor distributor. Prime Vendor War Readiness Material is used for sustainment while Prime Vendor Surge is used for initial surge requirements. Vendor Managed Inventory is similar to Prime Vendor War Reserve Readiness Materiel in that these contracts provide guaranteed access to medical supplies held by a distributor. Vendor Managed Inventories may be either contractor owned or Government purchased medical supplies. The distributor is responsible for ensuring the availability of the medical supplies identified in the contract when required. Vendor Managed

Inventories are normally put in place to support surge requirements. The last of the contingency contracting tools used by DLA are Corporate Exigency Contracts. Medical supplies and equipment under these contracts consist of guaranteed access to agreed upon products and quantities held by a manufacturer or a distributor. The medical supplies and equipment may be either contractor owned or government purchased. As with the other contracts, the contractor is responsible for ensuring the identified medical supplies and equipment are available in the contracted quantities and within the timelines provided. Corporate Exigency Contracts are normally used for sustainment requirements as opposed to surge requirements.<sup>39</sup>

An example of how these contingency contracts are saving millions of dollars can be highlighted with the procurement of Patient Movement Items (PMI) to support OIF in FY04. PMI are those medical equipment items that travel with a patient to support in-transit medical capability when a patient is evacuated from a forward area for treatment at the next level of care. The PMI system ensures continuity of care while preventing the depletion of equipment at forward units.<sup>40</sup> In FY04 the Army utilized the Corporate Exigency Contract and purchased 108 infusion pumps, 363 ventilators and 508 suction machines, and had all items delivered within 30 days at a total cost of \$3.9 million. This fully met the Army's requirement for these items in support of operations in Iraq and Afghanistan. The Army had previously identified their total requirement as 1,500 infusion pumps, 1,000 ventilators and 1,000 suction machines. If the Army had used old business practices they would have purchased this total requirement up-front and spent \$30.6 million.<sup>41</sup> This equipment would have been sitting in a warehouse, the majority of it would have never been used, and someone would have had to maintain the

equipment to ensure it was ready to deploy. This is just one example of how these contracts are saving the AMEDD millions of dollars.

Even with these contingency contracts in place and the \$299.7 million in DLA depot owned stocks, much of which is forward positioned, 39% of surge and sustainment requirements are still new acquisitions. This is a vast improvement from the Desert Storm era when contingency contracts were non-existent and 92% of surge and sustainment requirements were new acquisitions. New acquisitions can be time consuming and as a result have the potential to impact mission readiness. The Services need to continue to work with DLA to ensure requirements are properly identified and added to contingency contracts or depot stocks as required.<sup>42</sup>

The Defense Supply Center Philadelphia (DSCP) – Directorate of Medical Materiel is the Class VIII commodity manager for DLA and is responsible for maintaining the MCF. The MCF is an interactive web based program that allows the Services to input their requirements into the program. Once requirements are identified by the services in the MCF, DSCP is responsible for working with the commercial sector and obtaining contract coverage to ensure they are able to meet the time phased contingency requirements as identified by the Services. Progress, as measured by the number of MCF items with contract coverage, has been consistently improving since 2001 when only 30% of the MCF items were covered under contract.<sup>43</sup> As of 10 December 2009, 7,510 of the 13,584 MCF items have contract coverage, this equates to 55% coverage. More importantly, coverage in the two most critical areas, pharmaceutical items and medical-surgical items are at 66% and 69% respectively.<sup>44</sup>

The DSCP Medical Directorate also uses the Readiness Management Application (RMA) which provides them with medical logistics situational awareness in order to rapidly support contingency requirements. The application connects readiness related data with the commercial sector and allows collaboration that optimizes readiness support. Some of the critical features of the RMA include linking commercial product numbers to National Stock Numbers (NSN's), comparing commercial sales data to Service requirements to ensure the right item is identified for contingency planning, recommending the best commercial product to meet an NSN item (product of choice), and drawing data from the MCF to show what materiel is on contingency contracts. These features allow the Services to keep up with commercial medical advances, make product identification easier for the user, and most importantly facilitate requirements planning for contingencies.<sup>45</sup>

In the fall of 2002 the Secretary of Defense for Health Affairs directed the Joint Readiness Clinical Advisory Board (JRCAB), since renamed the Defense Medical Standardization Board (DMSB) to “implement a tool to increase the predictability and availability of pharmaceuticals to sustain forces in a deployed environment.”<sup>46</sup> Based on this tasking the DMSB developed the Joint Deployment Formulary (JDF) which was officially announced to the Services and implemented in January 2003. The JDF is a standardized list of pharmaceutical medications that has been reviewed and approved clinically by a clinical advisory board to be used for treatment of specific medical conditions. The JDF provides a common operating picture which physicians, logisticians, and pharmacists can use as a guide for planning during contingency operations. Physicians and pharmacists now have confidence that these medications

will be stocked by medical logisticians in theater, providing predictability and ready access to these medications.<sup>47</sup>

Using a formulary such as the JDF has additional benefits above and beyond that of standardization. As pointed out by the World Health Organization, formularies can also have the following benefits: (1) provides impartial and unbiased drug information to clinicians, which is critically important with new drug therapies; (2) promotes the appropriate use of safe and effective medications, thus leading to better patient outcomes; (3) eliminates the unsafe and ineffective use of poor quality medications and treatment therapies; and (4) reduces costs and improves access to essential medications. Carefully selecting a limited number of critical medications, which have proven safety, quality and efficacy records, leads to better health care, and provides better access to medications at a reduced cost.<sup>48</sup>

The current JDF is effectively being used in theater and is provided to units in advance, thereby providing pharmaceutical medication information to deploying physicians, pharmacists and logisticians. The JDF can also be accessed on-line through the DMSB website and currently consists of over 900 line items. Since the JDF is a living document, it can be modified based on recommendations from physicians and pharmacists. The JDF has become a very useful tool in the deliberate planning process for contingency operations. It allows physicians, pharmacists and logisticians to identify requirements in advance for standardized items and provides logisticians time to requisition these items and have them available for contingency operations. A physician can still order an item not on the JDF with approval from the theater surgeon, however,

the logistician must make it clear to the physician that ordering a non-standard item that is not stocked in theater will significantly increase the order ship time.<sup>49</sup>

The Defense Medical Materiel Standardization Program (DMMSP) is a new standardization initiative being driven by the Deputy Assistant Secretary of Defense (DASD) for Force Health Protection and Readiness (FHP&R). The DASD (FHP&R) “serves as the principal staff assistant and advisor to the Assistant Secretary of Defense Health Affairs for all DoD deployment medicine policies, programs, and activities.”<sup>50</sup> DASD (FHP&R) has provided guidance to the Military Health System (MHS) to “implement a program of medical materiel standardization built on commercial supportability; clinician-driven product requirements; and seamless integration of Medicoeconomic assessments.”<sup>51</sup> Additionally, the DMMSP will drive Joint and Service level doctrine, combat development, readiness plans and programs.<sup>52</sup>

The key attributes of the DMMSP are that clinicians will operate in a deployed environment as they train and practice in a peace time setting. If the practices cannot be logistically supported in an austere environment, then the patient should be evacuated to a location where the procedure can be supported. Joint and Service combat developers will build standardization and requirements based on current peace time clinical practices. Last, but not least, DoD standardization processes must be based on ensuring medical materiel requirements are supported by the same commercial supply chain that supports the MHS in peace time.<sup>53</sup>

The DMMSP includes a single governing body with a vast array of players to include membership from the DMSB, DLA, Service representation, the Joint Staff, TRICARE Regional Business Office (TRBO), Health Affairs, and others. This diverse



composition will improve the likelihood that all requirements are captured and a holistic solution will be produced. The DMMSF envisions facilitating information exchange that will eliminate duplicate clinical evaluation panels, providing the ability to define clinical requirements for further development of patient treatment, modeling tools that will assist with identifying logistical requirements, and serving as the clinical voice of authority for all Defense Medical Logistics issues.<sup>54</sup>

To support the “operate in peace time as we do in war time” concept the Services are deploying the Defense Medical Logistics Standard Support (DMLSS) automated medical logistics information system in all MTOE medical units. The DoD inspector general recommended in a recent report that DMLSS be installed and used at all medical treatment facilities in the CENTCOM AOR. CENTCOM in fact issued a policy in July of 2008 requiring the Services to deploy and use DMLSS. The Air Force, Navy and Marine Corps have already completed this task and the Army is projecting to fully deploy DMLSS by 2012.<sup>55</sup>

DMLSS has been deployed in the majority of our fixed facilities since the early to mid 2000’s. The DMLSS platform functionality includes stock control, prime vendor operations, research and price comparison, inventory management, medical equipment maintenance, and property accountability. DMLSS will provide standardized medical logistics applications to the Services for the first time with the increased benefit of merging peacetime practices with wartime readiness and sustainability operations.<sup>56</sup> This standardization across the peacetime and wartime continuum will alleviate the training issues which have arisen in past operations where the Services were using multiple medical logistics systems. The key will be to ensure MTOE units continue to

use DMLSS in order to maintain these perishable skills, and do not revert to “sneaker net” when they are in garrison.

As noted earlier, combat support hospitals have historically been unable to maintain their equipment at home station due to the dual mission nature of their mission. This was demonstrated in fiscal year 2008 and 2009 when less than 50% of CSH’s Left Behind Equipment (LBE) was fully mission capable when USAMMA pulled it in for maintenance.<sup>57</sup> Not only has maintenance been a challenge, but due to funding constraints, CSH’s are normally upgraded only every 5-7 years. This has resulted in units deploying with technologically obsolete equipment and, as discussed earlier, has led to clinicians submitting requests for non-standard equipment that has not been tested in the environment in which it will be used. The Medical Materiel Readiness Program (MMRP) is an Office of the Surgeon General (OTSG) initiative that will resolve this problem.<sup>58</sup>

The MMRP is planned and centrally managed by the USAMMA. It was developed as a method to support the Army Force Generation (ARFORGEN) model and improve the state of readiness of Army CSH’s.<sup>59</sup> The MMRP is a deliberate process to reduce equipment maintained at units and instead moves this equipment to Sierra Army Depot where it can be centrally maintained by a trained staff of equipment maintainers. Units will be fielded a baseline equipment set that will enable them to continue to conduct training at home station. The equipment package fielded to the unit can be tailored to the unit’s requirements and maintenance capabilities.<sup>60</sup>

The MMRP program will allow limited resources to be used more wisely. A limited number of hospitals will be maintained to 100% of equipment requirements. The

hospitals that will be maintained to 100% will have the most current technology available and be made available to any deploying unit; they will not be flagged to a specific unit. The AMEDD is still working to determine the number of hospitals that will need to be maintained at 100% to meet initial contingency requirements. Although all hospitals will not be fully equipped, there will be better visibility of maintenance status and shortages and through existing contingency contracts, outfitting hospitals beyond the surge will be much easier.<sup>61</sup>

Another identified shortfall was the lack of equipment availability at the Regional Training Sites – Medical (RTS-MED) and other collective training sites which limited the unit training these primary training locations could provide. Under the MMRP program these sites will be fielded with the most current equipment so they will be able to be used as an effective training platform for deploying medical units.<sup>62</sup>

## Conclusion

Great strides have been made in medical logistics procedures, methods, and systems in the past few years, however there is still room for improvement. As identified in the Joint Supply Joint Integrating Concept, supply planners must be integrated into all operational planning.<sup>63</sup> Medical logistics cannot continue to be an afterthought. Medical logistics planning must be completely integrated into operational planning as it is critical to requirements development and mission supportability. Lieutenant General William Pagnois pointed out the basic problem in Desert Shield was that we were trying to establish a logistical structure in the middle of a deployment.<sup>64</sup> Medical logisticians have historically arrived to the fight late which results in a reactive instead a proactive process of support. The medical community needs to continue to press the operational planners to ensure medical logisticians are deployed early to provide optimal support to

the warfighter. Medical logisticians, physicians, and pharmacists also need to work in unison to develop requirements that are clinically driven and supportable. Logisticians have an inherent responsibility to train the clinical community on the importance of identifying requirements early. Medical logisticians must manage expectations, educating physicians on the difference in order-ship-time between standard and non-standard items. This training and education results in improved mission readiness and customer satisfaction.

Integrating peace time and war time medical operations has many benefits. Practices become standardized producing a positive impact on training, and supporting the “train as you fight” concept. Standardizing medical equipment and medical supplies across both spectrums allows training to occur in the peace time setting which provides for a seamless transition to war time operations. Standardization also improves logistics supportability on two fronts: first, it allows medical maintainers to obtain the experience they need on equipment repair and second, it ensures that items are standardized in the system reducing order ship time when an item is requisitioned. The DMMSP standardization initiative shows great promise in this area and must be pursued with vigor.

The AMEDD cannot continue to ignore the reality that we will run sick call operations immediately upon entry into a deployed environment, as well as the fact that civilian casualties will be treated during deployed operations. The JDF has made strides in this area by including medications to treat these categories of patients in the formulary however, these requirements are not currently captured in our medical materiel sets. The AMEDD Combat Developer needs to review the current medical

materiel requirements within the DEPMEDS sets and ensure the necessary supplies and equipment items are added that will allow CSHs to treat the full array of patients they will ultimately encounter.

Medical logisticians need to continue to work solutions from a joint perspective. System solutions like DMLSS that provide joint integration of medical logistics processes promote unity of effort and provide holistic solutions. Medical logistics is a difficult profession that poses challenging problems. Limited resources and a changing operating environment require changes to previous methodologies. The MMRP illustrates a drastic change to previous AMEDD equipping strategies which will more efficiently use our scarce resources and provide for a more mission ready force. The AMEDD needs to continue to develop innovative solutions to the complex problems of equipping, sustaining and training the medical force. As future operations become increasingly joint focused, medical logisticians will need to develop policies and procedures that compel joint solutions.

## Endnotes

<sup>1</sup> U.S. Army Deputy Chief of Staff G-8 Plans and Policy Division, The Army Equipping Strategy (Washington, DC: U.S. Department of the Army, September 29, 2009), 1.

<sup>2</sup> U.S. General Accounting Office, Operation Desert Storm: Full Army Medical Capability Not Achieved (Washington, DC: U.S. General Accounting Office, August 1992), 38.

<sup>3</sup> U.S. Army Deputy Chief of Staff G-8 Plans and Policy Division, The Army Equipping Strategy (Washington, DC: U.S. Department of the Army, September 29, 2009), 1.

<sup>4</sup> Arthur M. Smith, "Joint Medical Support: Are We Asleep at the Switch?" Joint Forces Quarterly, (Summer 1995): 103.

<sup>5</sup> Lieutenant General Frank F. Ledford, Jr., "From the Surgeon General of the Army: Medical Support for Operation Desert Storm," The Journal of the U.S. Army Medical Department (January/February 1992), 3.

<sup>6</sup> Lieutenant General Frank F. Ledford, Jr., "From the Surgeon General of the Army: Medical Support for Operation Desert Storm," *The Journal of the U.S. Army Medical Department* (January/February 1992), 3-4.

<sup>7</sup> U.S. General Accounting Office, *Operation Desert Storm: Full Army Medical Capability Not Achieved* (Washington, DC: U.S. General Accounting Office, August 1992), 13.

<sup>8</sup> Major Angel E. Cintron and Major George D. Magee, "Medical Logistics Support to Desert Storm," *The Journal of the U.S. Army Medical Department* (September/October 1992), 35.

<sup>9</sup> Richard V.N. Ginn, *The History of the U.S. Army Medical Service Corps*, (Washington, DC: Office of the Surgeon General and Center of Military History United States Army, 1997) 433.

<sup>10</sup> Major Angel E. Cintron and Major George D. Magee, "Medical Logistics Support to Desert Storm," *The Journal of the U.S. Army Medical Department* (September/October 1992), 36.

<sup>11</sup> U.S. General Accounting Office, *Operation Desert Storm: Full Army Medical Capability Not Achieved* (Washington, DC: U.S. General Accounting Office, August 1992), 13.

<sup>12</sup> Colonel Richard I. Donahue and William H. Howell, "Equipment Sourcing for Hospital Units Deployed to Operation Desert Shield," *The Journal of the U.S. Army Medical Department* (March/April 1992) 24.

<sup>13</sup> U.S. General Accounting Office, *Operation Desert Storm: Full Army Medical Capability Not Achieved* (Washington, DC: U.S. General Accounting Office, August 1992), 30.

<sup>14</sup> Colonel William R. Smith, Jr. and Lieutenant Colonel Philip Lisagor, "Experience of the 31<sup>st</sup> Combat Support Hospital in Operation Desert Shield and Desert Storm: A Commander's Story," *The Journal of the U.S. Army Medical Department* (November/December 1992) 4.

<sup>15</sup> U.S. General Accounting Office, *Operation Desert Storm: Full Army Medical Capability Not Achieved* (Washington, DC: U.S. General Accounting Office, August 1992), 26-27.

<sup>16</sup> Major Angel E. Cintron and Major George D. Magee, "Medical Logistics Support to Desert Storm," *The Journal of the U.S. Army Medical Department* (September/October 1992), 37.

<sup>17</sup> U.S. General Accounting Office, *Operation Desert Storm: Full Army Medical Capability Not Achieved* (Washington, DC: U.S. General Accounting Office, August 1992), 27.

<sup>18</sup> Arthur M. Smith, "Joint Medical Support: Are We Asleep at the Switch?" *Joint Forces Quarterly*, (Summer 1995): 104.

<sup>19</sup> U.S. General Accounting Office, *Operation Desert Storm: Army Medical Supply Issues* (Washington, DC: U.S. General Accounting Office, August 1993), 6.

<sup>20</sup> U.S. General Accounting Office, *Operation Desert Storm: Full Army Medical Capability Not Achieved* (Washington, DC: U.S. General Accounting Office, August 1992), 32.

<sup>21</sup> Ibid

<sup>22</sup> 47<sup>th</sup> Combat Support Hospital Operation Iraqi Freedom Annual Historical Report (March 2003-December 2003), <https://secure-ll.amedd.army.mil/Reports/OIF/47thCSH-OIF1.htm> (accessed December 11, 2009) 31.

<sup>23</sup> Ibid, 32

<sup>24</sup> Carter B. Magruder, *Recurring Logistic Problems As I Have Observed Them* (Washington, DC: U.S. Government Printing Office, 1991), 37.

<sup>25</sup> Annual Industrial Capabilities Report to Congress, Under Secretary of Defense Acquisition (February 2007), Technology and Logistics Industrial Policy, 56.

<sup>26</sup> Logistics Management Institute, Medical Materiel Readiness Assessment, September 2003, 2.

<sup>27</sup> Ibid, 21

<sup>28</sup> 226<sup>th</sup> Medical Logistics Battalion Operation Iraqi Freedom After Action Report, <https://secure-ll.amedd.army.mil/Reports/OIF/Medical-Logistics/226-AAR.htm> (accessed January 25, 2010).

<sup>29</sup> Ibid

<sup>30</sup> Landstuhl Regional Medical Center After Action Report, [https://secure-ll.amedd.army.mil/Reports/OIF/ERMC\\_OIF\\_II\\_AAR.htm](https://secure-ll.amedd.army.mil/Reports/OIF/ERMC_OIF_II_AAR.htm), (accessed December 11, 2009).

<sup>31</sup> 591<sup>st</sup> Medical Logistics Battalion Operation Iraqi Freedom After Action Report, <https://secure-ll.amedd.army.mil/Reports/OIF> (accessed January 25, 2010) 21-24.

<sup>32</sup> 21<sup>st</sup> Combat Support Hospital Operation Iraqi Freedom Lessons Learned (19 March 2003 – 02 March 2004), <https://secure-ll.amedd.army.mil/ll/options.aspx>, (accessed December 20, 2009) 8-9.

<sup>33</sup> 591<sup>st</sup> Medical Logistics Battalion Operation Iraqi Freedom After Action Report, <https://secure-ll.amedd.army.mil/Reports/OIF> (accessed January 25, 2010) 16-18.

<sup>34</sup> 10<sup>th</sup> Combat Support Hospital Interim After Action Report, <https://secure-ll.amedd.army.mil/Reports/OIF/10th-CSH-Interim-AAR.htm>, (accessed December 11, 2009) 1.

<sup>35</sup> 47<sup>th</sup> Combat Support Hospital Operation Iraqi Freedom Annual Historical Report (March 2003-December 2003), <https://secure-ll.amedd.army.mil/Reports/OIF/47thCSH-OIF1.htm> (accessed December 11, 2009) 24.

<sup>36</sup> Ibid, 21

<sup>37</sup> Colonel Marsha A. Langlois, "Defense Logistics Agency Medical Supply Chain," briefing slides with scripted commentary, Defense Supply Center Philadelphia, PA, August 2009.

<sup>38</sup> Annual Industrial Capabilities Report to Congress, Under Secretary of Defense Acquisition (February 2007), Technology and Logistics Industrial Policy, 56.

<sup>39</sup> Colonel Marsha A. Langlois, "Defense Logistics Agency Medical Supply Chain," briefing slides with scripted commentary, Defense Supply Center Philadelphia, PA, August 2009.

<sup>40</sup> Headquarters, Department of the Army, Combat Health Logistics, Field Manual 4-02.1 (Washington, DC: Headquarters Department of the Army, September 28, 2001) F-1.

<sup>41</sup> Colonel Marsha A. Langlois, "Defense Logistics Agency Medical Supply Chain," briefing slides with scripted commentary, Defense Supply Center Philadelphia, PA, August 2009.

<sup>42</sup> Ibid

<sup>43</sup> Annual Industrial Capabilities Report to Congress, Under Secretary of Defense Acquisition (February 2007), Technology and Logistics Industrial Policy, 56.

<sup>44</sup> Michael Medora, Defense Supply Center Philadelphia, e-mail message to author, February 3, 2010.

<sup>45</sup> Colonel Marsha A. Langlois, "Defense Logistics Agency Medical Supply Chain," briefing slides with scripted commentary, Defense Supply Center Philadelphia, PA, August 2009

<sup>46</sup> Major Daniel J. Moroney, Forecasting Medical Materiel Requirements for Contingency Operations, Graduate Management Project (Fort Sam Houston, Texas: U.S. Army Baylor University Graduate Program in Health Care Administration, April 9, 2004), 32.

<sup>47</sup> Ibid

<sup>48</sup> The World Health Organization, "How to Develop a National Formulary Based On The WHO Model Formulary – A Practical Guide," 2004, [http://whqlibdoc.who.int/hq/2004/WHO\\_EDM\\_PAR\\_2004.8.pdf](http://whqlibdoc.who.int/hq/2004/WHO_EDM_PAR_2004.8.pdf) (accessed February 4, 2010).

<sup>49</sup> Major Daniel J. Moroney, Forecasting Medical Materiel Requirements for Contingency Operations, Graduate Management Project (Fort Sam Houston, Texas: U.S. Army Baylor University Graduate Program in Health Care Administration, April 9, 2004), 33.

<sup>50</sup> Deputy Assistant Secretary of Defense (DASD) for Force Health Protection and Readiness (FHP&R), <http://fhpr.osd.mil/mission.jsp> (accessed February 4, 2010).

<sup>51</sup> 2008 MHS Conference: Caring for American Heroes, "Defense Medical Materiel Standardization Program (DMMSP)", briefing slides, <http://www.health.mil> (accessed 18 January 2010).

<sup>52</sup> Ibid

<sup>53</sup> Ibid

<sup>54</sup> Ibid



<sup>55</sup> Department of Defense Inspector General, Medical Equipment Used to Support Operations in Southwest Asia (Arlington, VA: Department of Defense Inspector General, September 30, 2009), 16-17.

<sup>56</sup> The Defense Medical Logistics Standard Support (DMLSS) Homepage, <http://www.tricare.mil/dmlss> (accessed January 17, 2010).

<sup>57</sup> Lieutenant Colonel Charles Strite, "MMRP Information Brief," briefing slides with scripted commentary, U.S. Army Medical Materiel Agency, Fort Detrick, MD, October 8, 2009.

<sup>58</sup> Lieutenant Colonel Charles Strite, "MEDLOG Enterprise and USAMMA Initiative Charter: Expanding the Medical Materiel Readiness Program (MMRP)," U.S. Army Medical Materiel Agency, Fort Detrick, MD, March 11, 2009, 3.

<sup>59</sup> Ibid

<sup>60</sup> Lieutenant Colonel Charles Strite, "MMRP Information Brief," briefing slides with scripted commentary, U.S. Army Medical Materiel Agency, Fort Detrick, MD, October 8, 2009.

<sup>61</sup> Ibid

<sup>62</sup> Ibid

<sup>63</sup> Department of Defense, (Draft) Joint Supply Joint Integrating Concept version 0.5, (September 23, 2009) 26.

<sup>64</sup> Lieutenant General William G. Pagonis, Moving Mountains: Lessons in Leadership and Logistics from the Gulf War (Boston, MA: Harvard Business School Press, 1992), 87